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AUTHOR Cantor, Jeffrey A.
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ABSTRACT

This paper describes a formative/summative process for educational program evaluation, which is appropriate for higher education programs and is based on M. Provus' Discrepancy Evaluation Model and the principles of instructional design. The Discrepancy Based Methodology for Educational Program Evaluation facilitates systematic and detailed analyses of multiple educational program components in order to identify discrepancies among program specifications, actual outcomes, and accreditation guidelines for educational program development. The method was initially developed for use in the commercial nuclear power industry to review and evaluate training after the accident at Three Mile Island. The ultimate objective of the method is to ensure that the program at hand produces competent professionals, who are capable of performing their jobs in a safe, efficient manner. This evaluation is a three-phase process. The first phase analyzes utility program standards that define the program (what should be). The second phase analyzes the programmatic data (what is). During this phase, individual courses, instruction, media, methods and classroom processes, lesson plans, student records, and other program components are reviewed against institutional and accreditation standards. The third phase synthesizes the multiple discrepancy analyses, culminating in the interpretation and reporting of the evaluation findings. (TJH)

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Maximizing the impact of program evaluation: A discrepancy-based process for educational program evaluation

Jeffrey A. Cantor

Associate Professor, Business Education

Lehman College, City University of New York

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Maximizing the impact of program evaluation:

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Abstract

This paper describes a process for educational program evaluation based upon Provus' Discrepancy Evaluation Model and the principles of instructional design. The Discrepancy Based Methodology for Educational Program Evaluation facilitates systematic and detailed analyses of multiple educational program components in order to identify discrepancies between program specifications, actual outcomes, and accreditation guidelines for educational program development. This evaluation is a three-phased process. Phase One analyzes utility program standards which define the program (what should be). Phase Two analyzes the programmatic data (what is). Phase Three synthesizes the multiple discrepancy analyses, culminating in interpretation and reporting of the evaluation findings.

This paper describes a comprehensive process for educational program evaluation which is appropriate for higher education programs, especially in the professional and technical disciplines such as education and engineering. I initially developed this process for use in the commercial nuclear power industry to review and evaluate training after the accident at Three Mile Island. This process has a unique ability to be equally useful for higher education program evaluations, especially when these programs must meet regional higher education association and/or industry-specific accreditation reviews.

Need

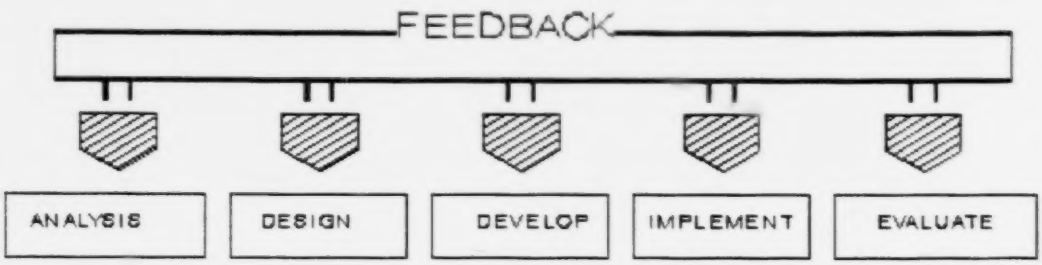
Viable state-of-the-art collegiate level professional programs is a subject of enormous importance in the preparation

of competent graduates. While recent events such as Three Mile Island and Chernobyl attest to the devastating consequences of professional incompetence in highly technical and complex environments, these professions are not the only ones under public scrutiny. The competence of teachers and other professionals have become equally scrutinized by American society. Higher education program assessment is therefore of interest to evaluators not only as professionals but also as citizens. It is for these reasons that a description of a process for analysis of complex professional educational programs and program outcomes, based upon a matching of empirical observations to program standards is both necessary and perhaps useful for all educators.

Within an institution of higher education as well as in industry a need exists to document professional readiness for duty. Formative program evaluation is an accepted practice for identifying areas where either professional competence, the educational program design, or its outcomes are deficient in meeting the needs of a profession. Evaluation of this kind is capable of producing data for use in external periodic accreditation reviews, such as professional or regional accreditation (as was the case for which this process was originally designed), or it can be useful by the faculty in collegiate program updating and redesign.

The process which I ultimately developed to assess Three Mile Island's technical education program needed to parallel the

instructional systems design procedures already in use by the utility, so as to effectively and adequately assess its many component processes and outcomes (see Figure 1). It was for this reason that I chose the Discrepancy Evaluation Model (Provus, 1973) as a conceptual basis for the evaluation design.



A Conceptual Framework

The ultimate objective of educational program evaluation is to ensure that the program produces competent professionals, capable of performing the job in a safe and efficient manner. To meet this objective an evaluation process must: provide a means to systematically collect, review, and analyze critical job requirements and performance data; match these data against accepted professional requirements, practices and procedures and policy; and ultimately match the data against the educational program's overall outcomes and performance record.

The Discrepancy Evaluation Model

I believe that a primary purpose of educational program evaluation is to determine whether to maintain, improve, or terminate a program or portion thereof. The educational

evaluation process described here incorporates the conceptual bases of decision-oriented evaluation models including the Discrepancy Evaluation Model (DEM) (see Figure 2) (Provus, 1973; Stufflebeam, et.al., 1971) with the concepts and elements of instructional systems design (ISD). The principles of ISD are sound and universally accepted in curriculum development for adult learning and training. As such, ISD principles should be incorporated into higher education curriculum development. Decision-oriented evaluation is appropriate for professional education and training evaluation because as a product-oriented process, it can be applied within the framework of ISD. Furthermore, it permits analysis of relationships between program outcomes and program objectives; and relationships between these outcomes and the context, input, and process evaluation data. Thus it facilitates: (a) stipulating program standards; (b) determining whether a discrepancy exists between some aspect of the education and training program and the standards governing that aspect of the program; and (c) using "discrepancy" information to identify the weaknesses of the educational program or its components (standard performance discrepancies "SPD"). Discrepancy analyses provides information leading to appropriate decisions, both immediate or formative as well as long-range summative decisions (Rog & Bickman, 1984).

S — P = D

DEM permits a stipulation of desired program outcomes in sufficient detail to be recognizable and measurable. An important characteristic of the DEM and the reason for its selection as the conceptual base for the design of this evaluation methodology was its ability to provide information to address several layers of educational program design and operation. In educational program evaluation, data is needed which will permit faculty to immediately correct individual courses or component parts (classroom lecture, laboratory, cooperative education, etc.) of the program; to assess overall outcomes of the program (in terms of graduates' job performance) over time; and/or to redefine aspects of the program's conceptual framework (instructional design procedural standards, performance objective formats, item writing standards, etc.). Therefore, formative and summative evaluation components are necessary.

The Discrepancy Based Methodology for Educational Program Evaluation

The Discrepancy Based Methodology for Educational Program Evaluation is designed in three phases. Phase One of the methodology permits a faculty member or evaluator (in the case of accreditation visits) to systematically review the overall educational process including educational (standards) stipulated by the accreditation (or certifying) agency and pinpoint any lack of congruence with accepted industry or accreditation standards. Phase Two of the methodology assesses individual educational components and their outcomes in order to determine congruence to

the respective program standard. Phase Three permits a synthesis of Phase One and Two discrepancy analyses findings, and a description and discussion of the overall indications.

The Discrepancy Based Methodology for Educational Program Evaluation, will identify discrepancy information which might lead to a change in the operation of the educational program or in the process by which the instruction is designed or delivered (Braun, 1981; Cantor, 1986a). Each stage of the program goes through a series of "SPD" cycles in attempting to provide the necessary information to address these questions:

1. Is the program well defined?
2. Is the program adequately delivered?
3. Are the enabling objectives being met?
4. Are the terminal products achieved?

Discrepancy information can also be used to redesign the educational standards and process, their relationship to the school-community organization as a whole, or to better control the process in the educational environment (Cantor, 1988; Montague, et. al., 1983; Cantor & Hobson, 1981). This methodology will specify:

a) discrepancies between accreditation agency's educational program development standards or guidelines and the school's educational development process or standard;

b) discrepancies between the school's standard and the school's actual educational program; and,

c) discrepancies between the school's program goals and

objectives and the graduates' performances.

Phase One - A School-Based Standard

All educational program standards all subscribe to either industry-based standards and some form of accreditation standards. In practice, evaluators first analyze the schools operation and standards against these accreditation guidelines and criteria. In actual operation this process is often conducted by the review team prior to arriving on the school scene.

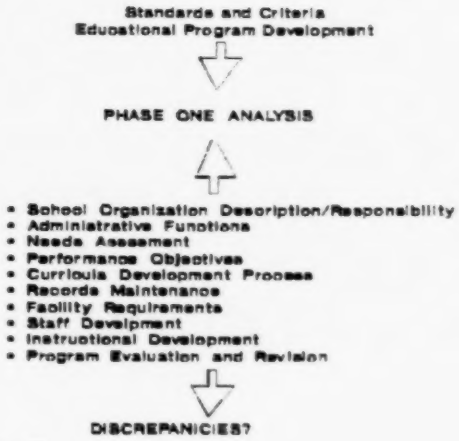


Figure 3

Figure 3 graphically describes the Phase One procedure. At this Phase of the review process, the team members are often not known to each other. The team should independently and individually examine evidence of procedures developed by the school organization against accreditation guidelines and note any and all discrepancies. Each member of the team must be familiar with guidelines, statutes, and procedures. Individual and independent review is aimed at capitalizing on the expertise of each team member's individual ability to arrive at appropriate conclusions without external influence from the other team

members (Cantor, 1986b).

These standards should include an educational program management plan which stipulates policy and procedures for educational management and decision making, composition of the school organization, and inter-organizational relationships. The standards specify elements of program administration to be reviewed. They include assignments and responsibilities, numbers, qualifications, continuing education of faculty or instructors, support personnel, length of program, program entry criteria, facility and media requirements, computer-simulator and on-the-job training, course schedules for initial and continuing education, course descriptions, lesson plans, etc. These standards provide a very specific process for an educational program needs assessment, performance objective development, procedures for data collection, and specific frequency of updates. They serve as a guideline for educational development and educational evaluation. A major part of this documentation is the maintenance of records both as an evaluative database source and as a legal requirement. Evidence of such a record-keeping system for student records and instructional files should be in place. Once the independent review is completed, the team should assemble on site at the school and begin a round-table discussion, reviewing and deliberating on their findings. The evaluation team should also interview faculty and administrators to determine their individual assessments of the educational standards used by the school, and their suggestions for

improvement or changes to make the standards more useful.

Moderated by the team chair, the objective of this two day session is to come to a group consensus on the First Phase review findings of the school educational standard. It should be noted that depending on whether this is to be a routine review or an external accreditation visit review, the report generated will contain recommendations for formative changes, or alternatively, be a part of a summative report on the state of the school training organization standard.

Phase One of The Discrepancy Based Methodology for Educational Program Evaluation verifies existence of these school standards very precisely, noting any deviations from the educational requirements. The accreditation criteria will remain a functional baseline over the course of the evaluation together with the school's own standard. Discrepancies which are identified in the school's standard will be noted in accordance with the accreditation criteria.

Phase Two - A School Review

Phase Two of the evaluation process reviews individual courses, instruction, media, methods and classroom processes, lesson plans, student records, including samples of learner performance outcomes as well as other educational program components, against both the school's standard and accreditation standard (if a Phase One discrepancy exists). Figure 4 graphically describes the Phase Two procedures. To assess the effects of the school's educational processes, this evaluation

tool also must be capable of analyzing the data for indications of worker on-the-job performance problems, and for indications of needs for further education or training to alleviate performance deficiencies, and then provide prescriptive formative findings of program outcomes (Cantor, 1988). It also must be capable of providing overall summative assessments of overall educational program success to address possible reporting requirements to state education departments as well as to other agencies.

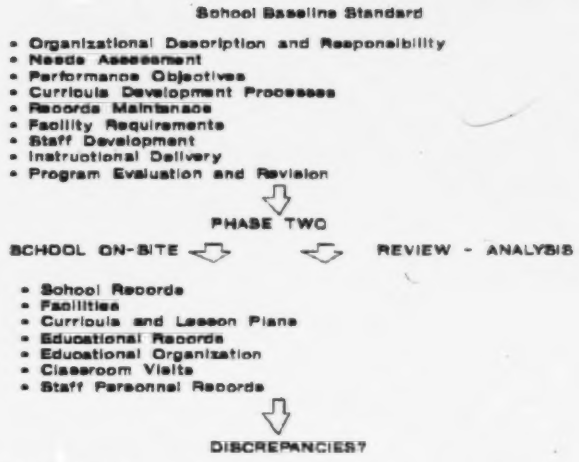


Figure 4

A significant aspect of this phase is conducted through the individual course evaluations and meetings and discussions with employers, faculty and instructors and course developers.

In Phase Two each of the areas of the schools' program is analyzed against the appropriate accreditation standards. Each of the following areas is analyzed:

- Needs Assessment data to determine if a process is followed, files maintained and key personnel are involved, etc.
- Processes for development of performance objectives exist (including writing styles, formats, etc.).
- Curricula development, lesson plans, media selection methods, etc. are verified using lesson plan files selected randomly from program files.

- Facilities, classrooms, labs, simulators are all personally observed.
- Instruction is formally observed and evaluated.
- Staff qualifications and development are reviewed and randomly selected staff records are selected and reviewed.
- The educational evaluation program is carefully studied and individual data trails followed to determine the means of data utility for program revision.

The outcomes of Phase Two are written and presented as indications for corrective action (formative findings) and later presented as summative findings if needed such as in assessments.

Phase Three - A Synthesis

Phase Three of The Discrepancy Based Methodology for Education and Training Program Evaluation involves synthesizing the findings of the Phase Two reviews and analyses. Figure 5 graphically represents Phase Three of this comprehensive discrepancy based program evaluation.

In Phase Three, all data supporting the school program analyses are compiled and reviewed. At this point discrepancies are noted in each of the evaluation component categories. Careful attention is given to review of data concerning course and program congruence to standards requirements; and to course and

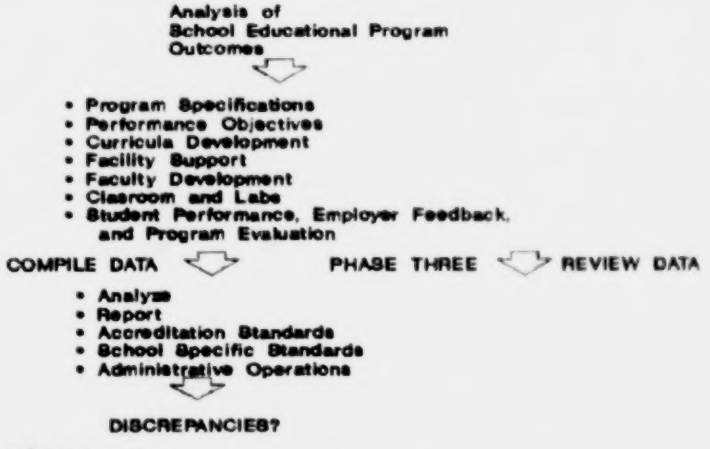


Figure 5

program outcomes. Data analyses of course and lesson plans are reviewed, lesson observation notes are studied, facilities reviews considered and final conclusions reduced to writing. The final report is actually two-fold: (1) A report of discrepancies between accreditation standards and school specific processes; and (2) A report of discrepancies between school specific processes and actual school program and educational operations and outcomes. Emphasis is placed on those areas and problems which school administrators should prioritize and incorporate into program revision. In-as-much as these evaluations are often used in accreditation and fiduciary support for the school, detailed findings, discrepancies, and problems need to be provided. The reporting procedure will involve an extensive briefing to educational administrators, and school and education officials.

In Conclusion

This article has discussed The Discrepancy Based Methodology for Educational Program Evaluation developed for use in the nuclear power industry. This systematic methodology is useful for identifying standards against which to assess educational program operation and successes, and a formative-summative discrepancy based process to review on-going programs. This methodology now offers higher education a new and refreshing tool with which to make positive inroads in the world of large scale organizational evaluation as well as other multi-faceted policy setting environments. Further, it allows an evaluator to gain a

useful and unambiguous "big picture" in heretofore difficult kinds of educational organizational evaluations.

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